

Checklist of Amphibians and Reptiles of Reserva Biológica do Tapirapé, Pará, Brazil

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ABSTRACT: In this study we present a list of amphibians and reptiles from the Reserva Biológica do Tapirapé (REBIOTA), an area in the Amazonian rainforest in Pará State, Brazil. We sampled the area for 21 days, in both dry and rainy seasons, using pitfall traps and active searching methods. Our efforts resulted in the discovery of 35 species of amphibians and 27 species of reptiles. This study provides the first list of amphibians and adds eight new species of reptiles for the Carajás region.

INTRODUCTION

The Amazonian morphoclimatic domain extends over an area of 6,717,772 km², from the Atlantic Ocean to the eastern slopes of the Andes, covering parts of nine countries: Brazil, Bolivia, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname and Venezuela (Ab'Saber 1970). The study site is located in the southeastern region of the State of Pará, in an area of intense mining industry known as Carajás. To buffer the local environment from the extensive human pressure in the region, a large area of over 800,000 ha of protected lands was established and called *Mosaico de Carajás*. As the name suggests, it is a conglomeration of five different reserves: Reserva Biológica do Tapirapé (REBIOTA), Floresta Nacional do Tapirapé-Aquiri, Floresta Nacional de Carajás, Floresta Nacional do Itacaiunas and Área de Proteção Ambiental do Igarapé Gelado.

Due to the historical background of mineral exploration in the area, the first scientific surveys in Carajás began

in 1969, when researchers from the Museu Paraense Emílio Goeldi conducted a faunal and floral survey in a mining area (Cunha *et al.* 1985). The first paper about the herpetofauna in the area was a description of a subspecies of turtle (Cunha 1970). Cunha *et al.* (1985) and Nascimento *et al.* (1987) presented lists of reptiles from the REBIOTA area. To date, there has been no documentation of the amphibians from this region. In this study, we provide the first comprehensive list for the herpetofauna of REBIOTA.

MATERIALS AND METHODS

The present study was conducted as part of the REBIOTA Management Plan. The REBIOTA is a 103 ha. reserve located in the municipalities of Marabá and São Félix do Xingú, Pará State. The base of our survey was the Bacaba Camp site (05°30'13" S, 50°16'44" W, elevation from 200 to 700 m – Figure 1). The predominant vegetation in the region is Open Ombrophile Forest and Dense Ombrophile Forest with palms, bamboos and canga (IBGE 1992).

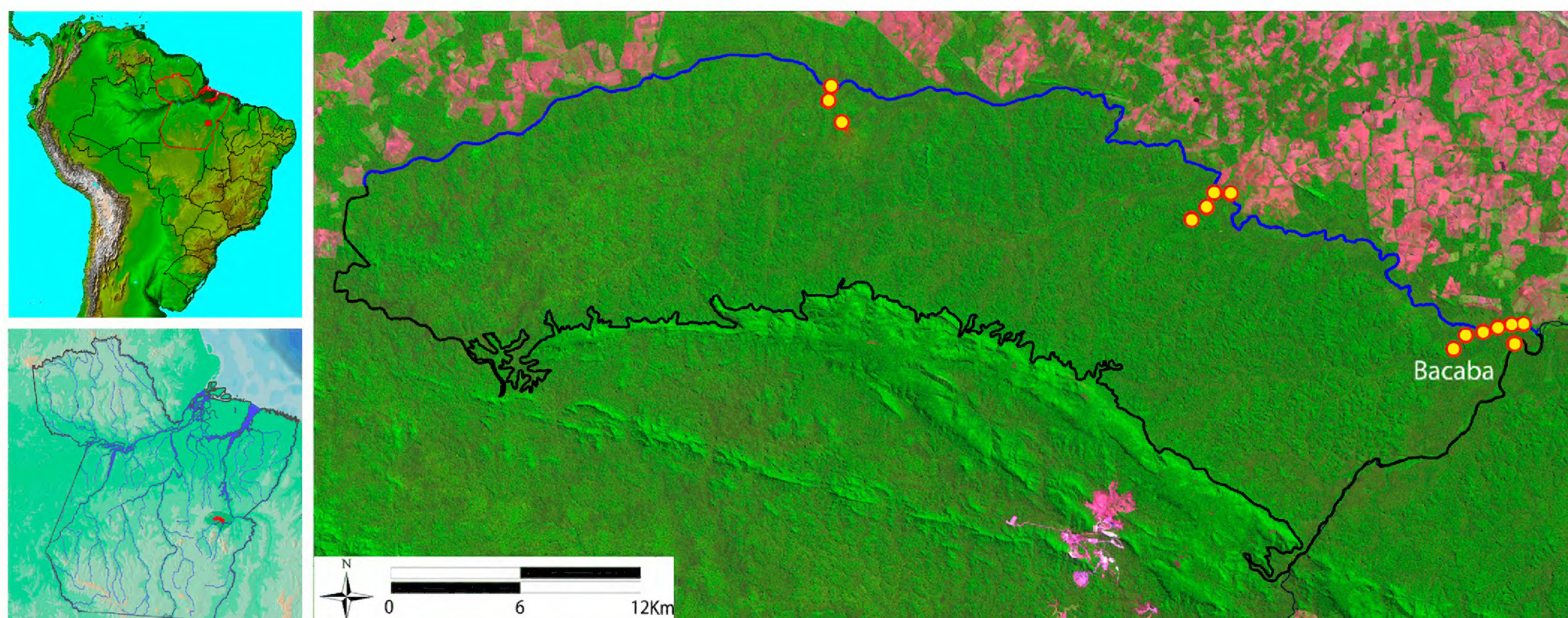


FIGURE 1. Map of the Reserva Biológica do Tapirapé. Green = Forest area; Pink = Anthropogenic area. Yellow circles: Sampled locations. Blue line: Tapirapé River.

Data were collected over two field surveys (August 3rd to 12th [dry season] and November 29th to December 9th [rainy season], 2008) for a total of 21 days of effective sampling. We used two complementary sampling methods: active searching and pitfall traps. Each line of pitfall trap was made using eight 60 L buckets placed eight m apart, with a drift fence 80 cm in height. The active searching method was conducted during both day and night, during day and night in all areas inside the REBIOTA, including trails in the forest and along the river (Figure 2) without standardization.

The specimens were collected under permit SISBIO number 16826-1 issued by the Brazilian Ministry of Environment (MMA- ICMBio) and deposited in the herpetological collection of the Museu de Zoologia da Universidade de São Paulo (Appendix I). Taxonomic nomenclature follows Frost *et al.* (2006) and Frost (2011) for amphibians and Gamble *et al.* (2008; 2011), Zaher *et al.* (2009), Forlani *et al.* (2010) and Hedges and Conn (2012) for reptiles.

RESULTS AND DISCUSSION

From a total of 21 days of fieldwork, 35 species of amphibians and 27 species of reptiles were recorded (Table 1; Appendix II). Among the species collected in the pitfall traps, *Engystomops petersii*, *Rhinella margaritifera*

and *Allobates marchesianus* were the most abundant respectively, together representing almost 60% of all specimens collected with this method.

During the first collecting period, in the dry season, we collected 12 species that were not recorded in the rainy season, one amphibian (*Allophryneruthveni*) and 10 reptiles (*Paleosuchus trigonatus*, *Leposoma* sp. n. (in description by Rodrigues *et al.*), *Iguana iguana*, *Copeoglossum nigropunctatum*, *Gonatodes eladioi*, *G. humeralis*, *Plica umbra ochrocollaris*, *Dipsas catesbyi*, *Erythrolamprus taeniogaster* and *Micrurus spixii martiusi*). During the rainy season we collected 16 species of amphibians (*Allobates femoralis*, *Dendropsophus* aff. *branneri*, *D. leucophyllatus*, *D. melanargyreus*, *D. nanus*, *D. parviceps*, *Hypsiboas calcaratus*, *H. cinerascens*, *H. fasciatus*, *H. multifasciatus*, *Osteocephalus leprieurii*, *Phyllomedusa hypochondrialis*, *Scinax ruber*, *Sphaenorhynchus lacteus*, *Trachycephalus typhonius* and *Leptodactylus mystaceus*) and five species of reptiles (*Podocnemis unifilis*, *Thecadactylus rapicauda*, *Drymarchon corais*, *Erythrolamprus reginae* and *Bothrops atrox*) that were not recorded during the dry season. Most amphibians collected belong to the family Hylidae, which tends to be more active during the rainy season. Twenty-nine species were found in both seasons, such as the tortoises *Chelonoidis carbonaria* and *C. denticulata* and the lizards *Ameiva ameiva* and *Uranoscodon superciliosus*.



FIGURE 2. Some of the sampled areas inside the REBIOTA. A: Primary forest trail; B: Margin of the Tapirapé River; C: Flooded forest; D: Pond surrounded by a swamp inside a primary forest.

These species were found both inside the forest and on the margin of the river. *Dendropsophus* aff. *branneri* and *Leposoma* sp. could not be determined to the species level, and may have been recorded in other areas under different names. The records of *Chiasmocleis jimi* and *Proceratophrys concavitympanum* constitute significant range extensions (Bernardo et al. 2012).

The region of REBIOTA was first surveyed in the 1970's (Cunha et al. 1985; Nascimento et al. 1987). Cunha et al. (1985) collected over an 18-month period in the Carajás region and recorded 77 species of reptiles, 17 of which were also recorded in this study. Two years later, Nascimento et al. (1987) published an updated list of reptiles from the same region, and added an additional 17 species. Among them they describe *Gonatodes eladioi* from a location approximately 80 km from our study area. Although the REBIOTA is in the same area studied by Nascimento et al. (1987), this is the first time this species has been recorded outside the type locality.

Our study provides the first list of amphibians and adds the following eight species of reptiles for the region of Mosaico de Carajás: *Paleosuchus trigonatus*, *Chelonoidis carbonaria*, *Arthrosaura kockii*, *Leposoma* sp., *Copeoglossum nigropunctatum*, *Plica umbra ochrocollaris*,

TABLE 1. List of amphibian and reptile species recorded in the Reserva Biológica do Tapirapé. Season: D- collected in dry season; R- collected in rainy season. Sampling method: P: Pitfall trap; AS: Active Search

SPECIES	SEASON	SAMPLING METHOD
AMPHIBIA		
ANURA		
Allophrynidae		
<i>Allophryne ruthveni</i>	D	AS
Arobomatidae		
<i>Allobates femoralis</i>	R	AS
<i>Allobates marchesianus</i>	D,R	P; AS
Bufonidae		
<i>Rhaebo guttatus</i>	D,R	P; AS
<i>Rhinella margaritifera</i>	D,R	P; AS
<i>Rhinella marina</i>	D,R	P; AS
Cyclorhamphidae		
<i>Proceratophrys concavitympanum</i>	D,R	P; AS
Hylidae		
<i>Dendropsophus</i> aff. <i>branneri</i>	R	AS
<i>Dendropsophus leucophyllatus</i>	R	AS
<i>Dendropsophus melanargyreus</i>	R	AS
<i>Dendropsophus nanus</i>	R	AS
<i>Dendropsophus parviceps</i>	R	AS
<i>Hypsiboas boans</i>	D,R	AS
<i>Hypsiboas calcaratus</i>	R	AS
<i>Hypsiboas cinerascens</i>	R	AS
<i>Hypsiboas fasciatus</i>	R	AS
<i>Hypsiboas geographicus</i>	D,R	AS
<i>Hypsiboas multifasciatus</i>	R	AS
<i>Osteocephalus leprieurii</i>	R	AS
<i>Osteocephalus taurinus</i>	D,R	AS
<i>Phyllomedusa hypochondrialis</i>	R	AS
<i>Scinax ruber</i>	R	AS
<i>Sphaenorhynchus lacteus</i>	R	AS
<i>Trachycephalus typhonius</i>	R	AS
Leiuperidae		
<i>Engystomops petersi</i>	D,R	P; AS

TABLE 1. CONTINUED.

SPECIES	SEASON	SAMPLING METHOD
<i>Physalaemus cuvieri</i>	D,R	P; AS
Leptodactylidae		
<i>Leptodactylus andreae</i>	D,R	P
<i>Leptodactylus lineatus</i>	D,R	P
<i>Leptodactylus mystaceus</i>	R	P; AS
<i>Leptodactylus petersii</i>	D,R	P; AS
<i>Leptodactylus rhodomystax</i>	D,R	P; AS
Microhylidae		
<i>Chiasmocleis avilapiresae</i>	D,R	P
<i>Chiasmocleis jimi</i>	D,R	P
<i>Ctenophryne geayi</i>	D,R	P
Strabomantidae		
<i>Pristimantis fenestratus</i>	D,R	P; AS
REPTILIA		
CROCODYLIA		
Alligatoridae		
<i>Paleosuchus trigonatus</i>	D	AS
TESTUDINES		
Podocnemidae		
<i>Podocnemis unifilis</i>	R	AS
Testudinidae		
<i>Chelonoidis carbonaria</i>	D,R	AS
<i>Chelonoidis denticulata</i>	D,R	AS
“SAURIA”		
Gymnophthalmidae		
<i>Arthrosaura kockii</i>	D,R	P; AS
<i>Arthrosaura reticulata</i>	D,R	P; AS
<i>Cercosaura ocellata ocellata</i>	D,R	P; AS
<i>Leposoma</i> sp.	D	P
Iguanidae		
<i>Iguana iguana</i>	D	AS
Mabuyidae		
<i>Copeoglossum nigropunctatum</i>	D	P; AS
Phyllodactylidae		
<i>Thecadactylus rapicauda</i>	R	AS
Sphaerodactylidae		
<i>Chatogekko amazonicus</i>	D,R	P; AS
<i>Gonatodes eladioi</i>	D	AS
<i>Gonatodes humeralis</i>	D	P; AS
Teiidae		
<i>Ameiva ameiva</i>	D,R	P; AS
<i>Kentropyx calcarata</i>	D,R	P; AS
Tropiduridae		
<i>Plica umbra ochrocollaris</i>	D	P
<i>Uranoscodon superciliosus</i>	D,R	AS
SERPENTES		
Boidae		
<i>Corallus hortulanus</i>	D,R	AS
Colubridae		
<i>Drymarchon corais</i>	R	AS
Dipsadidae		
<i>Dipsas catesbyi</i>	D	AS
<i>Erythrolamprus reginae</i>	R	P
<i>Erythrolamprus taeniogaster</i>	D	P
<i>Leptodeira anullata</i>	D,R	P; AS
<i>Philodryas argentea</i>	D,R	AS
Elapidae		
<i>Micrurus spixii martiusi</i>	D	P
Viperidae		
<i>Bothrops atrox</i>	R	AS

Corallus hortulanus and *Erythrolamprus taeniogaster*. Even though it is a widespread species, the presence of *E. taeniogaster* represents a new record for this area.

Conservation

According to the National Protected Areas Plan (Plano Nacional de Áreas Protegidas), the REBIOTA is classified in the map of Priority Areas for Conservation, Sustainable Use and Benefit Sharing of the Brazilian Biodiversity (MMA 2007), as a protected area of extremely high biological importance. The greater importance of REBIOTA is mainly due to the fact that it is a representative fragment of the original vegetation, which is rare in the private areas in the region occupied by large farms and agricultural projects. Even with extensive protected areas nearby, the REBIOTA is the only area of “Integral Protection”, and that gives it a central role in the conservation of species on this Amazonian region. Our records, together with the previous works by Cunha *et al.* (1985) and Nascimento *et al.* (1987) help to create a more comprehensive list of species of reptiles and amphibians in the Carajás region and help specialists to make more appropriate decisions regarding the diversity of that area.

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LITERATURE CITED

- Ab'Saber, A.N. 1970. Províncias geológicas e domínios morfoclimáticos no Brasil. *Geomorfologia* 20: 1–26.
- Bernardo, P. H., W. Matiazzi, and R.A. Guerra-Fuentes. 2012. Distribution extension and distribution map of *Chiasmocleis jimi* Caramaschi and Cruz, 2001 (Amphibia: Anura: Microhylidae) and *Proceratophrys concavitympanum* Giarretta, Bernarde and Kokubum, 2000 (Amphibia: Anura: Cycloramphidae). *Check List* 8: 152–154.
- Cunha, O.R. 1970. Uma nova subespécies de quelônio, *Kinosternon scorpioides carajasensis* da Serra dos Carajás, Pará (Testudinata-Kinosternidae). *Boletim do Museu Paraense Emílio Goeldi* 73: 1–12.
- Cunha, O.R., F.P. Nascimento and T.C. Avila-Pires. 1985. Os répteis da área de Carajás, Pará, Brasil (Testudines e Squamata). I. *Publicações Avulsas do Museu Paraense Emílio Goeldi* 40: 9–92.
- Forlani, M.C., P.H. Bernardo, C.F.B. Haddad and H. Zaher. 2010. Herpetofauna do Parque Estadual Carlos Botelho, SP. *Biota Neotropica* 10(3): 1–95.
- Frost, D.R. 2011. *Amphibian Species of the World: an Online Reference. Version 5.5 (31 January, 2011)*. Electronic Database accessible at <http://research.amnh.org/vz/herpetology/amphibia/>. Captured on 1 November 2011.
- Frost, F.D., T. Grant, J. Faivovich, R.H. Bain, A. Haas, C.F.B. Haddad, R.O. De-Sá, A. Channing, M. Wilkinson, S.C. Donnellan, C.J. Raxworthy, J.A. Campbell, B.L. Blotto, P. Moler, R.C. Drewes, R.A. Nussbaum, J.D. Lynch, D.M. Green and W.C. Wheeler. 2006. The amphibian tree of life. *Bulletin of the American Museum of Natural History* 297: 1–370.
- Gamble, T., A.M. Bauer, E. Greenbaum and T.R. Jackman. 2008. Evidence for Gondwanan vicariance in an ancient clade of gecko lizards. *Journal of Biogeography* 35: 88–104.
- Gamble, T., J.D. Daza, G.R. Colli, L.J. Vitt and A.M. Bauer. 2011. A new genus of miniaturized and pug-nosed gecko from South America

- (Sphaerodactylidae: Gekkota). *Zoological Journal of the Linnean Society*, 163 (4): 1244–1266.
- Hedges, S.B. and C.E. Conn. 2012. A new skink fauna from Caribbean islands (Squamata, Mabuyidae, Mabuyinae). *Zootaxa*, 3288: 1–244.
- IBGE. 1992. *Manual Técnico da Vegetação Brasileira*. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística. 92p.
- MMA. 2007. *Áreas Prioritárias para Conservação, Uso Sustentável e Repartição de Benefícios da Biodiversidade Brasileira: Atualização – Portaria MMA nº9, de 23 de janeiro de 2007. Série Biodiversidade, v. 31*. Brasília: Ministério do Meio Ambiente, Secretaria de Biodiversidade e Florestas. 300 p.
- Nascimento, F.P., T.C. Avila-Pires and O.R. Cunha. 1987. Os répteis de Carajás, Pará, Brasil (Squamata) II. *Boletim do Museu Paraense Emílio Goeldi* 3(1): 33–65.
- Zaher, H., F.G. Grazziotin, J.E. Cadle, R.W. Murphy, J.C.de Moura-Leite and S.L. Bonatto. 2009. Molecular phylogeny of advanced snakes (Serpentes, Caenophidia) with an emphasis on South American Xenodontines: a revised classification and descriptions of new taxa. *Papéis Avulsos de Zoologia* 49: 115–153.

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APPENDIX 1. Voucher specimens.

AMPHIBIA

ANURA: Allophrynidae: *Allophryne ruthveni* MZUSP 139666-68. **Arobomatidae:** *Allobates femoralis* MZUSP 140108; *Allobates marchesianus* MZUSP 139643-65, MZUSP 140142. **Bufonidae:** *Rhaebo guttatus* MZUSP 139570-79, MZUSP 140156-57; *Rhinella margaritifera* MZUSP 139598-612, MZUSP 140046-49; *Rhinella marina* MZUSP 139584, MZUSP 139613, MZUSP 140134. **Cyclorhamphidae:** *Proceratophrys concavitympanum* MZUSP 139426-30, MZUSP 140118-19. **Hylidae:** *Dendropsophus aff. branneri* MZUSP 140158-161; *Dendropsophus leucophyllatus* MZUSP 140096-106; *Dendropsophus melanargyreus* MZUSP 140122-26; *Dendropsophus nanus* MZUSP 140143- 55; *Dendropsophus parviceps* MZUSP 140175-79; *Hypsiboas boans* MZUSP 139469-70, MZUSP 139669, MZUSP 140052-53; *Hypsiboas calcaratus* MZUSP 140060; *Hypsiboas cinerascens* MZUSP 140110-13; *Hypsiboas fasciatus* MZUSP 140120-21; *Hypsiboas geographicus* MZUSP 1394622, MZUSP 140055-58; *Hypsiboas multifasciatus* MZUSP 140133; *Osteocephalus leprieurii* MZUSP 140117, MZUSP 140119; *Osteocephalus taurinus* MZUSP 139580, MZUSP 140050-51; *Phyllomedusa hypochondrialis* MZUSP 140074-80; *Scinax ruber* MZUSP 140054, MZUSP 140122, MZUSP 140127, MZUSP 140129; *Sphaenorhynchus lacteus* MZUSP 140061-69; *Trachycephalus typhonius* MZUSP 140107. **Leiuperidae:** *Engystomops petersi* MZUSP 139614-34, MZUSP 139639, MZUSP 140135-36; *Physalaemus cuvieri* MZUSP 139667-68, MZUSP 140081-84, MZUSP 140086-88. **Leptodactylidae:** *Leptodactylus andreae* MZUSP 139394, MZUSP 139585-96, MZUSP 140169-74; *Leptodactylus lineatus* MZUSP 139463, MZUSP 140070-73; *Leptodactylus mystaceus* MZUSP 140089-95; *Leptodactylus petersii* MZUSP 139448-61, MZUSP 140131-32, MZUSP 140162-68; *Leptodactylus rhodomystax* MZUSP 139464-65, MZUSP 140114-15. **Microhylidae:** *Chiasmocleis avilapiresae* MZUSP 139431, MZUSP 140109; *Chiasmocleis jimi* MZUSP 139635-42, 140085, 140139-41; *Ctenophryne geayi* MZUSP 139581-83, MZUSP 140130. **Strabomantidae:** *Pristimantis fenestratus* MZUSP 139437-47, MZUSP 140137.

REPTILIA

TESTUDINES: Podocnemidae: *Podocnemis unifilis* MZUSP 4357. **Testudinidae:** *Chelonoidis denticulata* MZUSP MZUSP 4356.

“SAURIA”: Gymnophthalmidae: *Arthrosaura kockii* MZUSP 98380-2, MZUSP 98613-14; *Arthrosaura reticulata* MZUSP 98343-50, MZUSP 98607-09; *Cercosaura ocellata ocellata* MZUSP 983411, MZUSP 98615; *Leposoma sp.* MZUSP 98345, MZUSP 98351-54. **Iguanidae:** *Iguana iguana* MZUSP 98417. **Mabuyidae:** *Copeoglossum nigropunctatum* MZUSP 98357-58. **Phyllodactylidae:** *Thecadactylus rapicauda* MZUSP 98612. **Sphaerodactylidae:** *Chatogekko amazonicus* MZUSP 98375-76, MZUSP 98618-19, MZUSP 98623; *Gonatodes eladioi* MZUSP 98379; *Gonatodes humeralis* MZUSP 98377-78. **Teiidae:** *Ameiva ameiva* MZUSP 98342, MZUSP 98374, MZUSP 98610-11; *Kentropyx calcarata* MZUSP 98359-68; MZUSP 98372, MZUSP 98604-06, MZUSP 98616-17, MZUSP 98873. **Tropiduridae:** *Plica umbra ochrocollaris* MZUSP 98369-71; *Uranoscodon superciliosus* MZUSP 98413, MZUSP 98620-22.

SERPENTES: Boidae: *Corallus hortulanus* MZUSP 17447-48, MZUSP 17508-09. **Colubridae:** *Drymarchon corais* MZUSP 17505. **Dipsadidae:** *Dipsas catesbyi* MZUSP 17441; *Erythrolamprus taeniogaster* MZUSP 17446; *Erythrolamprus reginae* MZUSP 17506; *Leptodeira annulata* MZUSP 17442-43, MZUSP 17502-03; *Philodryas argentea* MZUSP 7445, MZUSP 17504. **Elapidae:** *Micrurus spixii martiusi* MZUSP 17444. **Viperidae:** *Bothrops atrox* MZUSP 17497-501.

APPENDIX 2. Live specimens collected at the REBIOTA: 1: *Allophryne ruthveni*; 2: *Allobates femoralis*; 3: *Allobates marchesianus*; 4: *Rhaebo guttatus*; 5: *Rhinella margaritifera*; 6: *Rhinella marina*; 7: *Proceratophrys concavumpanum*; 8: *Dendropsophus* aff. *branneri*; 9: *Dendropsophus leucophyllatus*; 10: *Dendropsophus melanargyreus*; 11: *Dendropsophus nanus*; 12: *Dendropsophus parviceps*; 13: *Hypsiboas boans*; 15: *Hypsiboas cinerascens*; 17: *Hypsiboas geographicus*; 18: *Hypsiboas multifasciatus*.



APPENDIX 2. Continuation: 19: *Osteocephalus leprieurii* 20: *Osteocephalus taurinus*; 21: *Phyllomedusa hypochondrialis*; 22: *Scinax ruber*; 23: *Sphaenorhynchus lacteus*; 24: *Trachycephalus typhonius*; 25: *Engystomops petersi*; 26: *Physalaemus cuvieri*; 27: *Leptodactylus andreae*; 28: *Leptodactylus lineatus*; 29: *Leptodactylus mystaceus*; 30: *Leptodactylus petersii*; 31: *Leptodactylus rhodomystax*; 32: *Chiasmocleis avilapiresae*; 33: *Chiasmocleis jimi*; 34: *Ctenophryne geayi*; 35: *Pristimantis fenestratus*; 36: *Paleosuchus trigonatus*.



APPENDIX 2. Continuation: 37: *Podocnemis unifilis*; 38: *Chelonoidis carbonaria*; 39: *Chelonoidis denticulata*; 40: *Arthrosaura kockii*; 41: *Arthrosaura reticulata*; 42: *Cercosaura ocellata ocellata*; 43: *Leposoma* sp.; 44: *Iguana iguana*; 45: *Thecadactylus rapicauda*; 46: *Copeoglossum nigropunctatum*; 47: *Chatogekko amazonicus*; 48: *Gonatodes eladioi* (female); 49: *Gonatodes humeralis*; 50: *Ameiva ameiva*; 51: *Kentropyx calcarata*; 52: *Plica umbra ochrocollaris*; 53: *Uranoscodon superciliosus*; 54: *Corallus hortulanus*.



APPENDIX 2. Continuation: 55: *Drymarchon corais* (juvenile); 56: *Dipsas catesbyi*; 57: *Erythrolamprus reginae*; 58: *Erythrolamprus taeniogaster*; 59: *Leptodeira annulata*; 60: *Philodryas argentea*; 61: *Micrurus spixii martiusi*; 62: *Bothrops atrox*.

